What Works Clearinghouse

INSTITUTE OF EDUCATION SCIENCES

Middle School Math March 12, 2007

Transition Mathematics

Program description

Transition Mathematics aims to increase 7th- through 12th-grade students' skills in applied arithmetic, pre-algebra, and pre-geometry. This one-year curriculum also addresses general application to different wordings of problems, types of numbers, and contexts for problems and aims to promote mathematical reading skills. The curriculum uses the University of Chicago School Mathematics Project (UCSMP) textbook. The sequence of the topics intends to assist the transition from arithmetic to algebra and geometry.

Research

One study of *Transition Mathematics,* first edition, comparing it with *Expert Mathematician,* met the What Works Clearinghouse (WWC) evidence standards. One study of the first edition and one study of the second edition of the intervention, comparing it with diverse curricula used in different schools, met WWC evidence standards with reservations. The three studies included more than 2,000 students in seventh, eighth, and ninth grades in schools throughout the United States.[1]

Effectiveness

Transition Mathematics was found to have mixed effects on mathematics achievement.

	Math achievement
Rating of effectiveness	Mixed effects
Improvement index[2]	Average: +0 percentile points Range: –14 to +19 percentile points

1. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
2. These numbers show the average and range of improvement indices for all findings across the studies.

Additional program information

Developer and contact

Developed by the University of Chicago School Mathematics Project (UCSMP). Address: 6030 S. Ellis Avenue, Chicago, IL 60637. Web: http://socialsciences.uchicago.edu/ucsmp/Secondary.html. Telephone: (773) 702-1130. The second edition curriculum is distributed by Pearson, Prentice Hall. Email: Communications@pearsoned.com. Web: http://www.phschool.com/atschool/ucsmp/index.html. Telephone: (800) 848-9500.[3]

Scope of use

Transition Mathematics, first edition was developed and tested between 1983–86. *Transition Mathematics,* second edition was developed and tested in 1992–94.[4] The third edition has been in development since 2004. According to the developers at the University of Chicago, since 1983, 3.5–4 million students in elementary, middle, and high schools have been using UCSMP materials and curricula. Scope of use and demographic characteristics of students using *Transition Mathematics* are not available.

Teaching

The curriculum introduces algebra by examining different uses of variables and variable representation on the number line and coordinate plane. The course also introduces basic algebra skills and connects geometry to arithmetic, measurement, and algebra. Numbers are viewed as representative of real objects and events, not abstraction. The use of numbers and operations in real-life situations is emphasized. Among the chapters included in the second edition textbook are decimal notation, large and small numbers, measurement, uses of variables, problem-solving strategies, real numbers, coordinate graphs, and equations. The use of scientific calculators and computer exercises is integrated into the curriculum. According to the publisher, this curriculum implements the National Council of Teachers of Mathematics' standards by emphasizing applications, writing, problem solving, and technology.

Cost

A student textbook costs $55.47. A teacher resource book, *Implementing UCSMP: A User's Handbook,* costs $12.97. An additional Study Skills Handbook costs $30.97.

Research

Three studies reviewed by the WWC investigated the effects of *Transition Mathematics.* One study (Baker, 1997) was a randomized controlled trial that met WWC evidence standards in the original review and met WWC evidence standards in this updated review. Two studies (Hedges, Stodolsky, Mathison, & Flores, 1986; Thompson, Senk, Witonsky, Usiskin, & Kaeley, 2005) used a quasi-experiment design that met WWC evidence standards with reservations.

Met evidence standards

Baker (1997) included 90 eighth-grade students in four classrooms who were randomly assigned to either a *Transition Mathematics* (n = 45) or *Expert Mathematician* (n = 45) group.

Met evidence standards with reservations

Hedges et al. (1986) included 40 matched pairs of pre-algebra classrooms from urban, suburban, and rural schools located in several states in the United States and represented a wide range of socioeconomic groups. Students in the comparison classrooms used mathematics curricula other than *Transition Mathematics.*

Thompson et al. (2005) included 91 students in four matched pairs of classrooms in two inner-city schools and one rural school in the West, upper Midwest, and Southeast. The sample was made up of a diverse student population, including low socioeconomic and minority populations. Students in the comparison group used non-UCSMP materials—also referred to as "traditional mathematics materials"—which were used by the schools before the study.

3. According to the developer, the third edition will be available from the Wright Group/McGraw Hill.
4. The second edition includes new features designed to broaden teacher assessment strategies of students' math knowledge, understanding, and in-depth exploration and to encourage and model students' writing about mathematics.

Effectiveness

Findings

The WWC review of interventions for middle school math addresses student outcomes in the mathematics achievement domain.

Baker (1997) reported that *Transition Mathematics* students scored lower than *Expert Mathematician* students on the Objectives by Strand test, but that the difference was not statistically significant.[5] The WWC confirmed that the difference was not statistically significant, but found that it was large enough to be considered substantively important according to WWC criteria.

Hedges et al. (1986) reported *Transition Mathematics* classrooms scored statistically significantly higher than comparison classrooms on three outcomes: the Orleans-Hanna Algebra Prognosis test, the High School Subjects Test: General Mathematics, and the Geometry Readiness test. The WWC analysis confirmed these results for the Geometry Readiness test, but found no statistically significant differences for the Orleans-Hanna Algebra Prognosis test and the General Mathematics test.[6]

Thompson et al. (2005) examined student outcomes using the High School Subjects Test: General Mathematics, Geometry Readiness test, Algebra Readiness test, and Problem-Solving and Understanding test. The study reported a statistically significant difference favoring the *Transition Mathematics* group on the Geometry Readiness test, but this difference was not statistically significant according to WWC criteria. The study reported no statistically significant differences on the other measures.[7] The average effect size across all four student outcomes was neither statistically significant nor large enough to be considered substantively important (that is, at least 0.25).

In sum, of the three studies that examined the impact of the first and second editions of *Transition Mathematics*, one study showed a substantively important negative effect, one study showed a statistically significant positive effect, and one study showed an indeterminate effect.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings,[8] the size of the difference between participants in the intervention and comparison conditions, and the consistency in findings across studies (see the WWC Intervention Rating Scheme).

5. Baker (1997) also reported statistically significant improvement between pretest and posttest experienced by both *Transitional Mathematics* and *Expert Mathematician* students. *Expert Mathematician* was reviewed by the WWC, and the findings of this review are presented in the WWC *Expert Mathematician* Intervention Report.
6. Hedges et al. (1986) also analyzed findings separately for students using calculators and students not using calculators. The WWC analysis confirmed a statistically significant positive effect for students using calculators.
7. This WWC review focuses on reported results from the study that use all items in the study measures. The study also examined performance on subsets of items of the General Mathematics test and the Algebra Readiness test that were aligned with the mathematics content that students had the opportunity to learn in class—those subsets of items are referred to in the study as "fair test" and "conservative test." The study reported a statistically significant positive effect of the *Transition Mathematics* curriculum using both the fair and conservative versions of the Algebra Readiness test, but no statistically significant effects using the fair and conservative versions of the General Mathematics test.
8. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the WWC Tutorial on Mismatch. See Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate the statistical significance. In the case of *Transition Mathematics*, corrections for clustering and multiple comparisons were needed for part of the studies reviewed. See WWC *Transition Mathematics* Technical Appendices for further details.

The WWC found *Transition Mathematics* to have mixed effects for mathematics achievement

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study and an average improvement index across studies (see Technical Details of WWC-Conducted Computations). The improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analyses. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.

The average improvement index for mathematics achievement is +0 percentile points across the three studies, with a range of –14 to +19 percentile points across findings.

Summary

The WWC reviewed three studies on *Transition Mathematics.* Of these, one study met WWC evidence standards and two studies met WWC evidence standards with reservations. Based on the results of the three studies, the WWC found mixed effects on students' mathematics achievement. The evidence presented in this report is limited and may change as new research emerges.

References

Met WWC evidence standards

Baker, J. J. (1997). Effects of a generative instructional design strategy on learning mathematics and on attitudes towards achievement. *Dissertation Abstracts International, 58*(7), 2573A. (UMI No. 9800955).

Met WWC evidence standards with reservations

Hedges, L. V., Stodolsky, S. S., Mathison, S., & Flores, P. V. (1986). *Transition Mathematics Field Study.* Chicago: University of Chicago.

Thompson, D. R., Senk, S. L., Witonsky, D., Usiskin, Z., & Kaeley, G. (2005). *An evaluation of the second edition of UCSMP Transition Mathematics.* Chicago: University of Chicago School Mathematics Project.

For more information about specific studies and WWC calculations, please see the WWC *Transition Mathematics* Technical Appendices.